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Surface Condition of Commercial Steel Wires

Denominations and Abbreviations thereof

DIN 1653

Oberflächenbeschaffenheit handelsüblicher Stahldrähte; Benennungen und deren Abkürzungen

1 Scope

This Standard applies to commercial steel wires, the surface condition of which results from the manufacturing processes normally used in wire refinement, and which are manufactured in large quantities.

This Standard does not apply to steel wires, the surface condition of which is obtained by special processes. Such wires include steel wires with coatings applied by galvanic (electrolytic) nickel plating, chrome plating, cadmium plating etc., or by enamelling, or steel wires with metallic coatings already applied which are subsequently treated chemically. Such steel wires are not considered to be commercial.

2 Purpose

The object of this Standard is to lay down uniform denominations and abbreviations thereof for the surface condition of drawn steel wire; the manufacturing technique concerned forms the basis of these denominations. The denominations, or if necessary their abbreviations (e.g. for space-saving reasons) according to this Standard are intended for use when compiling designations, in particular when specifying standardized steel wires for the compilation of designations in Standards.

3 Surface condition

No	Denomination	Abbreviation	Meaning
1 Surfaces obtained by drawing without any after-treatment			
1.1	Bright *)	bk *)	
1.1.1	Dry bright *)	tr bk *)	Drawn through pulverized lubricants such as soap, stearates or similar substances
1.1.1.1	Dry bright grey	tr bk gr	Drawn without copper plating
1.1.1.2	Dry bright reddish	tr bk rt	Drawn with thin copper plating
1.1.1.3	Dry bright copper plated	tr bk cu	Drawn with thicker copper plating
1.1.1.4	Dry bright phosphated	tr bk phr	Drawn with phosphated surface
1.1.2	Lubricated bright	sm bk	Drawn through very viscous greases of mineral oil base, tallow, synthetic waxes or similar substances
1.1.3	Grey bright	gr bk	Drawn through rape oil, thin-bodied mineral oils or similar substances
1.1.3.1	Grey bright phosphated	gr bk phr	Drawn with phosphated surface
1.1.4	Clear bright *)	he bk *)	Drawn through clear bright drawing grease or similar substances
1.1.4.1	Clear bright reddish	he bk rt	Drawn with thin copper plating
1.1.4.2	Clear bright copper plated	he bk cu	Drawn with thicker copper plating
1.1.5	Wet bright *)	n bk *)	Drawn through aqueous greases or oil emulsions
1.1.5.1	Wet bright grey	n bk gr	Drawn without metal admixture
1.1.5.2	Wet bright white	n bk ws	Drawn with admixture of tin salt
1.1.5.3	Wet bright reddish	n bk rt	Drawn with thin copper plating
1.1.5.4	Wet bright copper plated	n bk cu	Drawn with thicker copper plating
1.1.5.5	Wet bright yellowish	n bk ge	Drawn with admixture of tin salt and copper salt

*) When the above surface denominations or abbreviations are specified in purchase order designations for steel wires, it is left to manufacturer's discretion to supply commercial steel wires (e.g. according to DIN 177) with surfaces which are subordinated to the surface conditions or abbreviations specified according to this Standard.

Continued on pages 2 and 3
Explanations on page 4

No	Denomination	Abbreviation [1]	Meaning
2 Surfaces obtained by drawing and mechanical after-treatment			
2.1	Ground	sl	Ground after drawing, to improve the surface
2.2	Polished	po	Polished after drawing, to remove remnants of drawing compound and to improve the surface
3 Surfaces with metallic coatings			
3.1	Copper plated *)	cu *)	
3.1.1	Dip-copper plated	ta cu	Copper coating created electrochemically without the aid of an external source of electric current
3.1.2	Galvanically [2] copper plated	gal cu	Copper coating applied cathodically with the aid of an external source of electric current
3.2	Bronze plated *)	bz *)	
3.2.1	Dip-bronze plated	ta bz	Copper-tin-(bronze)-coating created electro-chemically without the aid of an external source of electric current
3.2.2	Galvanically [2] bronze plated	gal bz	Copper-tin-(bronze)-coating applied cathodically with the aid of an external source of electric current
3.3	Brass plated *)	ms *)	
3.3.1	Galvanically [2] brass plated	gal ms	Copper-zinc-(brass)-coating applied cathodically with the aid of an external source of electric current
3.4	Galvanized *) [3]	zn *)	
3.4.1	Hot galvanized *)	t zn *)	Zinc coating obtained by dipping in molten zinc
3.4.1.1	Finally hot galvanized	t s zn	Application of the zinc coating is the final working operation
3.4.1.2	Hot galvanized and drawn	t zn k	After application of the zinc coating, the wire is cold drawn with a reduction in its cross-section which can vary
3.4.2	Electrogalvanized [2] *)	gal zn *)	Zinc coating applied cathodically with the aid of an external source of electric current
3.4.2.1	Finally electro-galvanized	gal s zn	Application of zinc coating is the final working operation
3.4.2.2	Electrogalvanized and drawn	gal zn k	After application of the zinc coating, the wire is cold drawn with a reduction in its cross-section which can vary
3.5	Galvanized and leaded	zn pb	Lead coated after application of a zinc coating
3.6	tin plated *)	sn *)	
3.6.1	Hot tin plated *)	t sn *)	Tin coating obtained by dipping in molten tin
3.6.1.1	Finally hot tin plated	t s sn	Application of the tin coating is the final working operation
3.6.1.2	Hot tin plated and drawn	t sn k	After application of the tin coating, the wire is cold drawn with a reduction in its cross-section which can vary
3.6.2	Electrotinned [2] *)	gal sn *)	Tin coating applied cathodically with the aid of an external source of electric current
3.6.2.1	Finally electrotinned	gal s sn	Application of the tin coating is the final working operation
3.6.2.2	Electrotinned and drawn	gal sn k	After application of the tin coating, the wire is cold drawn with a reduction in its cross-section which can vary
3.7	aluminium plated *)	al *)	
3.7.1	Hot aluminium plated *)	t al *)	Aluminium coating obtained by dipping in molten aluminium
3.7.1.1	Finally hot aluminium plated	t s al	Application of the aluminium coating is the final working operation
3.7.1.2	Hot aluminium plated and drawn	t al k	After application of the aluminium coating, the wire is cold drawn with a reduction in its cross-section which can vary

*) See page 1

[1] The abbreviation ta denotes dipping in an acidified aqueous solution of a salt of the respective metal, whilst the abbreviation t denotes dipping in the molten metal itself (thermal treatment), see also DIN 50975.

[2] Also designated as "electrolytically".

[3] **Note:** Depending on the thickness of the zinc coating, a distinction is made between „standard galvanized" (no zn) and "thick galvanized" (di zn) (see for this e.g. DIN 1548).

No	Denomination	Abbreviation	Meaning
4 Surfaces with non-metallic coatings			
4.1	Enamelled	la	Surface-treated by stove enamelling
4.2	Plastic coated	kst	
4.2.1	Plastic sheathed	E kst	Plastic coated by extrusion process
4.2.2	Plastic laminated	W kst	Plastic coated by whirl sintering process
4.3	Phosphatized	phr	Protective coating obtained by dipping in a solution containing metallic phosphates
4.4	Borax treated	bx	Protective coating obtained by dipping in a borax (sodium borate) solution
4.5	Limed	ca	Protective coating obtained by dipping in milk of lime
5 Surfaces resulting from a heat-treatment with or without after-treatment			
5.1	Annealed *)	g *)	
5.1.1	Bright annealed	bk g	Annealed under exclusion of air, in a vacuum or under inert gas to prevent any oxidation of the surface
5.1.2	Annealed free from scale	z g	Annealed under almost total exclusion of air, so that only annealing colours and cracked residues of drawing compound are present on the surface, without any scale formation
5.1.3	Blue annealed	bl g	Annealed under almost total exclusion of air, so that only residues of drawing compound and only a thin blue oxide layer are present on the surface
5.1.4	Black annealed	sw g	Annealed with air admission and oxidation of the surface
5.1.5	Annealed and pickled	g gb	Pickled after annealing
5.1.5.1	Annealed, pickled and phosphatized	g gb phr	Protective coating obtained by dipping in a solution containing metallic phosphates
5.1.5.2	Annealed, pickled and borax treated	g gb bx	Protective coating obtained by dipping in a borax (sodium borate) solution
5.1.5.3	Annealed, pickled 4) and limed	g gb ca	Protective coating obtained by dipping in milk of lime
5.2	Hardened and tempered *)	v *)	
5.2.1	Bright hardened and tempered	bk v	Hardened and tempered under inert gas to prevent any oxidation of the surface
5.2.2	Dark hardened and tempered	dl v	Hardened and tempered without any additional oxidation-preventive medium
5.2.3	Hardened and tempered and polished	v po	Polished after hardening and tempering, to improve the surface

*) See page 1

4) The abbreviations for other possible after-treatments should be formed appropriately, e.g.: g gb cu.

Explanations

The Standard DIN 1653 is intended to regularize the surface denominations of commercial steel wires and the abbreviations thereof in accordance with the present day manufacturing techniques, in order to arrive at a uniform system of designations out of the multiplicity of designations previously used by producers and users, and to avoid misunderstandings and as a result wrong deliveries.
The specification of the manufacturing procedure which results in a given surface condition is only intended as a guideline. Identical or similar surfaces, e.g. resulting from annealing and hardening and tempering processes, have been listed separately, because differences can be ascertained on closer inspection, and because the manufacturing procedure is usually quite different basically.

Wires which are produced in large quantities by the wire refining works, including e.g. ground and polished valve spring wires, have been classified as commercial, whereas wires produced only occasionally in accordance with special methods, such as nickel plated, cadmium plated, chrome plated, copper and aluminium plated or enamelled wires, are not considered as being commercial.

The abbreviations have as a general rule been formulated in such a way that they incorporate the first letter of the corresponding denominations; exceptions to this rule have only been made in cases where existing abbreviations were already featured in other standards on allied subjects, and where it was of course logical to adopt the same abbreviations if possible. It was also impossible to avoid some of the abbreviations adopted from coinciding with symbols or abbreviations relating to different subjects; this is because the number of letters and letter combinations available is relatively limited.

No qualitative or quantitative statements have been made; such statements are appropriate in test standards resp. quality standards, e.g. the composition and thickness of metallic or non-metallic coatings etc.

The object of the abbreviations is to save space or to simplify the designation on drawings, parts lists and orders, or to compile designations for standardized steel wires.